UNIVERSITY OF GONDER

COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF INTERNAL MEDICINE

Prevalence of Anemia and its associated factors among adult people living with HIV/AIDS taking antiretroviral therapy in Debre Tabor Hospital, Northwest, Ethiopia

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Gondar, Ethiopia

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Acronyms

AIDS	Acquired Immune Deficiency Syndrome
ANRS	Amhara National Regional State
ARSHB	Amhara Regional State Health Bureau
ART	Antiretroviral Therapy
AZT (ZDV)	Zidovudine
CD4	Cluster of Differentiation 4
CTIDHM	Clinical Tropical Infectious Disease and HIV Medicine
EPI INFO	Epidemiological Information
ERB	Ethical Review Board
ETB	Ethiopian Birr
FMOH	Federal Minster of Health
HAART	Highly Active Anti Retroviral Therapy
Hgb	Hemoglobin
HIV	Human Immunodeficiency virus
MCV	Mean corpuscular volume
OI	Opportunistic Infections
OPD	Outpatient Department
PLWHA	people living with HIV AIDS
PI	Principal Investigator
RBC	Red Blood Cell
SPSS	Statistical Package for Social Sciences
TB	Tuberculosis
UOG	University of Gondar
WHO	World Health Organization
WBC	White Blood Cell

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Abstract

Background: Anemia, defined as a decreased concentration of blood hemoglobin, is a major public health problem in persons living with HIV /AIDS particularly in people taking antiretroviral therapy (ART). Anemia in HIV/AIDS patient has effect on their quality of life and disease progression to AIDS. Studies regarding anemia among HIV/AIDS patients taking ART and its associated factors are scarce in Ethiopia society

Objective: The aim of this study was to determine prevalence of Anemia and its associated factors among adult PLWHA who are taking antiretroviral therapy in Debre Tabor Hospital, Northwest Ethiopia, 2015

Methods: A Hospital based Cross-Sectional quantitative study was employed in Debre Tabor Hospital from January 1, 2010-December 30, 2014.Simple random sampling technique was used; the total sample size was 385.

Data was extracted from patient's chart by using structured checklist. It was entered using EPI INFO version 7.1 and analyzed by using SPSS version 20. Both descriptive and Analytic statistics were carried out. Bivariate and multivariable logistic regression analysis was also made. Variables with P value < 0.05 were considered significant in multivariable Analysis.

Results: A total of 377 patients chart were reviewed, the overall prevalence of anemia was 23.1% (95% CI: 19.1, 27.6)**.** The multivariable analysis showed that ART naïve patients (AOR=3.37, 95% CI: 1.59, 7.14), Zidovudine containing regimen (AOR=2.14, 95% CI: 1.03, 4.57), anti tuberculosis drugs (AOR=3.21, 95% CI: 1.19, 8.67) and Cluster of Differentiation 4 (CD4) count of < 200 cells/mm^3 (AOR=2.13, 95% CI: 1.04, 4.36) were significantly associated with occurrence of anemia.

Conclusions: The prevalence of anemia was moderate and found to be public health problem. Duration of ART, type of ART drugs, anti TB drugs and CD4 count < 200 cells/mm^3 was significantly associated with occurrence of anemia**.**

Recommendation: Early diagnosis and treatment of anemia is recommended for HIV /AIDS patients taking ART.

Keywords: HIV, AIDS, Anemia, Antiretroviral therapy, Debretabor hospital

1. Introduction

1.1Statement of the problem

Anemia is defined as a hemoglobin level <12 gm/dl for adult female and <13 gm/dl for adult male (1).Anemia is a global health problem in both developing and developed countries with major consequences on human health as well as social and economic development (2). Globally, anemia affects 1.62 billion people, which corresponds to 24.8% of the population (2). It is the most common Hematologic abnormalities in patients with HIV infection and those taking antiretroviral therapy (3). It occurs at any stage of HIV infection and its prevalence and severity are correlated with progression of the disease (4). The prevalence is about 28% among people with HIV infection and 71% in those with AIDS respectively (5)

Prevalence of Anemia among adult HIV/AIDS patients taking ART ranging from 23-50% in worldwide (6, 7) and 24-58% in Africa (8, 9). Anemia among adult HIV/AIDS patients taking ART in Ethiopia is a common problem, with a prevalence ranging from 11.5%-35% (10, 11)

The cause of anemia in patients with HIV infection are blood loss, neoplastic disease, opportunistic infection, low CD4 count ,high viral load, use of myelosuppressive medications,HIV infection per se, a decreased production of endogenous erythropoietin, nutritional deficiencies and Increased RBC destruction(hemolysis) (12)

Anemia in HIV/AIDS patients cause fatigue, pale skin, shortness of breath, dizziness and other symptoms associated with impaired physical functioning, psychological distress, and decrements in quality of life, increases HIV disease progression and leads to shorter life expectancy (12)

Management of anemia in HIV/AIDS patients taking ART has been shown to improve survival and quality of life. Getting treatment for anemia is very important and the type of treatment will depend on the cause or type of anemia (13)

Appropriate diagnosis and management of anemia for HIV/AIDS patients is important public heath measure .Hence the current study was determine the prevalence of anemia and associated factors in people living with HIV.

1.2. Literature review

1.2.1.Prevalence of Anemia among adult PLWHA taking ART

Studies done at different countries suggested that anemia is a major public health problem in PLWHA. A study done in India on ART indicates that anemia has been reported in 23% of all patients (6). A study conducted in Indonesia showed that the prevalence of anemia was found in 49.6% of ART naïve patient (7). A study conducted in Uganda showed that the prevalence of anemia among HIIV/AIDS patients taking ART was 47.8% (14).

A study done in Ghana revealed the incidence of anemia as 63% in ART-naïve patients and 46% on ART patients (8) .A study conducted in Nigeria indicated that the incidence of anemia was 57.5% in ART-naive patients, it was significantly higher than their counterparts on ART which was 24.3% (9).

A retrospective cohort study done on Incidence and risk factors of anemia among HIV/AIDS patients taking ART at tertiary hospitals in Addis Ababa, Ethiopia indicated that the overall incidence of anemia was 35.3% (15)

Health Facility-based study conducted in Jimma University specialized hospital showed that, the overall prevalence of anemia was (23.1%), as well the prevalence of anemia in ART naive and ART experienced persons was 29.9% and 16.2%, respectively (16)

A study conducted in University of Gonder Hospital, the overall prevalence of anemia in ART experienced patients ranged from 11.5%-35% (10, 11)

1.2.2.Factors associated with Anemia among adult PLWHA taking ART

1.2.2.1.Sociodemographic factors

Different studies documented that sex is significantly associated with anemia among HIV/AIDS patients taking HAART. Studies conducted in South Africa (17) , Namibia (18), University of Gonder Hospital, Ethiopia (19) showed that females were significantly associated with occurrence of anemia than males. Whereas a study conducted in Nigeria (20) and Hawassa university referral hospital (21), Ethiopia showed that male patients had higher chance of being anemic than females

In a study conducted at Jimma University hospital, South west Ethiopia ,among HIV/AIDS patients taking ART, anemia was prevalent in rural residents (16)

A study conducted in University of Gondar Hospital, Northwest Ethiopia among HIV/AIDS patients taking ART indicates that the odds of anemia among divorced and widowed participants were 2.3 times and 3.1 times respectively as compared to married counter parts (19)

A study at University of Gondar Hospital, showed that anemia was higher in illiterate patients as compared with those who completed secondary education. In this study patients who were earning < 500 birr were more likely to develop anemia as compared to those earning > 500 birr (19)

1.2.2.2. Medication related factors

Different studies showed that duration of ART had significantly associated with anemia among HIV/AIDS patients taking ART. Studies conducted in Ghana (8), South Africa (17), and a cohort study in Namibia (18) showed that ART-naïve patients are at higher risk of developing anemia compared to patients on ART experienced groups

Studies documented that ART regimen has significant associated with anemia among HIV/AIDS patients taking ART. Studies conducted in Indonesia (7)**,** Iran (22), Namibia (18) and Ethiopia (15) showed that ZDV containing regimen was significantly associated with anemia compared to non ZDV based regimes.

A study conducted in India the incidence of anemia was higher in HIV-infected patients treated with Anti TB drugs compared with those not treated with Anti TB drugs (23)

1.2.2.3. Co morbidities

Studies conducted in different areas among HIV/AIDS patient taking ART showed that presence of opportunistic infections is significantly associated with anemia. A study conducted among HIV/AIDS patient taking ART in Uganda (14) and Ethiopia (15, 16) showed that presence of opportunistic infections were significantly associated with anemia

1.2.2.4. WHO HIV Staging

A study conducted in South Africa among HIV infected patients initiating ART showed that advanced HIV disease was associated with increased incidence of anemia over the follow-up period (17)

1.2.2.5. Hematological related factors

Different studies documented that low CD4 count is associated with anemia among HIV/AIDS patients taking ART. A study conducted in Mexico (24)**,** South Africa (17), Namibia (25) and Ethiopia showed that CD4 count <200 cells/µl is significantly associated with anemia

A cross-sectional analytical study conducted in Mexican population among HIV/AIDS patients taking ART showed that WBC (white blood cell) <4,000 cells/mm and platelets <200,000 cells/mm were associated with anemia (24)

CONCEPTUAL FRAMEWORK

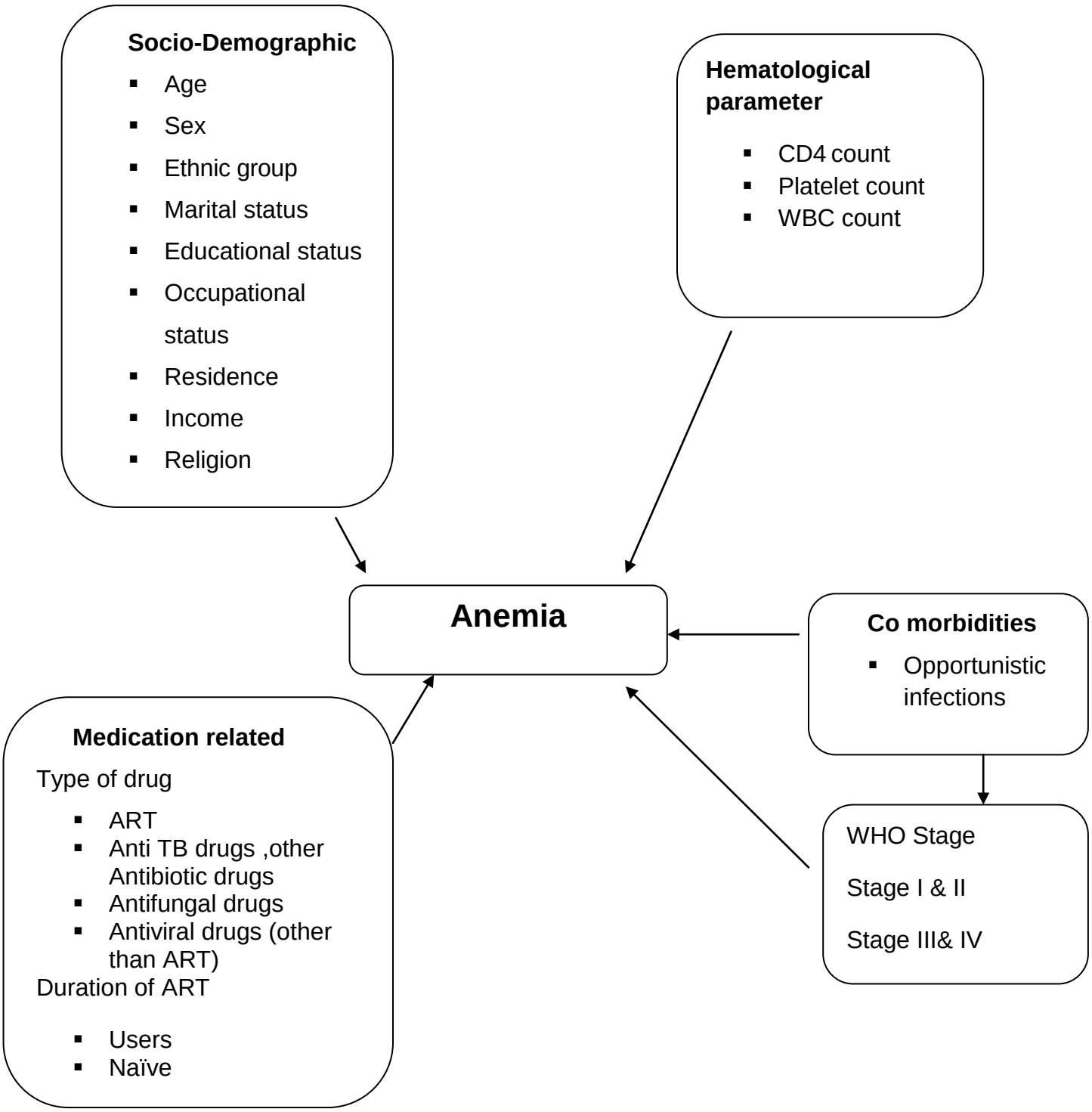

Fig 1: Conceptual frame work of anemia among adult PLWHA patients taking ART and its associated factors

Source: Developed by the principal investigator by reviewing different literatures

1.3 Justification of the study

Anemia is the most common hematological finding in patients with HIV infection, particularly in individuals with more advanced HIV disease in developing country. The presence of anemia in HIV/AIDS patients taking ART associated with faster disease progression and then decreases the quality of life and survival rate of HIV patients. Recovery from anemia is associated with decreased risk of death.

Knowing correction of anemia leads to improved quality of life and decreases in morbidity and mortality in HIV-infected patients taking ART, studies on the prevalence of anemia in HIV infected patients taking ART and its associated factors has not been very well understood in the study area

Therefore, the aims of this study investigate prevalence and associated factors of anemia among adult PLWHA taking ART.

The result of the study will help policy makers, stakeholders, responsible persons in the health institution, and significant others to take actions

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2. Objectives

2.1. General objective

- To determine prevalence of Anemia and its associated factors among adult people living with HIV/AIDS who were on ART in Debre Tabor Hospital, Northwest Ethiopia.

2.2. Specific objectives

- To determine prevalence of anemia among adult people living with HIV/AIDS who were on ART.
- To identify factors associated with anemia among adult people living with HIV/AIDS who were on ART.

3. Methods

3.1. Study design and period

Hospital based cross-sectional quantitative study was employed. The study period was from April- May, 2015.

3.2. Study area

The study was conducted at Debre Tabor General Hospital. The hospital is located in Northwest Ethiopia, Amhara National Regional State, in Debre Tabor town 665 km from the country capital. Currently the hospital has catchment population of about 2.3 million serving as General hospital for all population in the zone and nearby woredas. It has capacity of 91 beds for inpatient with five disciplines (Surgery, Internal medicine, pediatrics, Gynecology/Obstetrics and neonatology) with 12 outpatient department (OPDs).

One of the service that the hospital deliver is ART and follow up for HIV/AIDS patients and serves about 20-30 HIV/AIDS patients per day at ART clinic during working hours.

3.3. Source and study population

3.3.1. Source population

The source populations were all adult PLWHA who were taking antiretroviral therapy at Debretabor Hospital in Debre Tabor Town of South Gondar Administrative Zone.

3.3.2. Study population

The study populations were all adult PLWHA who were on ART in Debre Tabor Hospital, from January 1, 2010-December 30, 2014.

3.4. Inclusion and exclusion criteria

3.4.1. Inclusion criteria

- All adult people living with HIV/AIDS age ≥15 years who were taking ART in Debre Tabor hospital from January 1, 2010-December 30, 2014.

3.4.2. Exclusion criteria

- Those HIV/AIDS patients who were on ART with missing hemoglobin results on the chart, either at baseline or during follow-up.
- Pregnant women and women in the post-partum period (within 6 weeks post delivery
- Anemic patients at ART initiation

3.5 Sample size & sampling procedures

3.5.1. Sample size determination

The sample size was calculated by using single population proportion formula.

$$n = \frac{(Z_{\alpha/2})^2\, p(1-p)}{d^2}$$

$$n = \frac{(1.96)^2\,(0.35)(1-0.35)}{(0.05)^2} = 350$$

Where

n=Estimated sample size

P= Single population proportion (35%) =>proportion of anemia in adult PLWHA who were taking ART(10).

$\mathbf{Z_{\alpha/2}}$ = value of standard normal distribution (Z-statistic) at the 95% confidence level (α= 0.05) which is 1. 96,

d= Margin of error 5% (0.05);

10% = a contingency for incomplete data

The total sample size of the study population was **385**

Sampling for some independent variables by using EPI INFO stat calc.(19)

Variable name	Proportion of anemia (P)	OR	n	Assumption
Female sex	70.3	0.74	146	CI=95%
Income < 500 ETB	65.8	0.51	348	Power=80%
HAART users	75.8	0.7	204	Ratio 1:1

Since the sample size for the above explanatory variables are less than the sample size of the outcome variable (anemia) I took the sample size of the outcome variable.

3.5.2. Sampling procedures

Simple random sampling technique was used to obtain predetermined sample size from the ART clinic computerized register.

First the total of 686 patient charts registration number was identified and written on SPSS version 20,385 charts were selected by using computer generated (SPSS selection cases) method among adult PLWHA taking ART charts.

3.6 Operational definitions

- **Anemia** is defined as a hemoglobin level <12 g/dl for adult female and <13 g/dl for adult male, in accordance with WHO guideline.
- **ART naive** patients defined as HIV-infected patients who were taking ART for ≤ 6 months where as **ART users(experienced)** patients defined as HIV-infected patients who were taking ART for >6 months
- **WHO HIV/AIDS** clinical staging was defined as the clinical grade of the adult participant at ART initiation according to the WHO clinical staging guideline (grade 1 to 4)

3.7 Variables

Dependent variable

- Anemia (Presence or Absence)

Independent variables

- **Socio-Demographic**
  - Age (years), Sex, Residence, Ethnic group, Religion, Marital status, Educational Status, occupational status ,Monthly income
- **Medication related factors**
  - Duration of HAART usage
  - Type of drug
- **History of opportunistic infection**
- **WHO stage**
- **Hematologic parameter**
  - CD4 count, Platelet count, WBC count

3.8. Data collection tool

A structured checklist, in English languages was used to collect data. Hemoglobin measurements (hemoglobin level <12 gm/dl for adult female and <13 gm/dl for adult male), was obtained from the patients charts by reviewing the selected charts from January 1, 2010-December 30, 2014.

It was designed to seek information pertaining to socio-demographic characteristics (age, sex, marital status, employment, educational level etc), OI, WHO Stage, hematologic parameters, medication related factors, measurements, and presence of anemia.

3.9. Data quality control

The checklist was pre-tested through a random selection of 5% of the charts of HIV/AIDS patients who were taking ART from Debretabor Health center to assess whether the checklist items was easily understood by data collector. Careful modification of the checklist was done; before the main study was begin.

Three data collectors and one supervisor were recruited for the data collection, and training was given for 2 days, regarding the research tool and how to collect data from patient chart. Information exchange by telephone and close supervision by the principal investigator and supervisor was made on a daily basis in order to correct problems during the course of the data collection time, frequent checking of information collected for errors, missing values and its consistency in order to set right daily. Coding and data cleaning was done

3.10. Data processing and analysis

Data was entered using EPI INFO version 7.1 and was checked and cleaned for completeness and consistency of values and variables. Data were export to Statistical Package for the Social Sciences /SPSS/ version 20 for further analysis, through checking missing values, computing calculable variables & recoding.

Descriptive statistics were done using statistical measurements. Frequency, percentages, means, standard deviations, finally tables and graphs was used to report findings. Bivariate analysis was done to check which variables have associations with anemia. Variables found to have p-values up to 0.2 was fitted in multivariable logistic regression for controlling the possible effects of confounders and finally the variables which have significant association with the outcome variable were identified on the basis of OR, 95% CI, p-values <0.05 and Hosmer-Lemeshow goodness of test for the model was also checked.

4. Ethical considerations

Ethical clearance was obtained from Institutional Ethical Review Board (IERB), Institute of Public Health, University of Gondar. Permission letter was obtained from Debre Tabor Hospital Chief Executive officer.

5. Dissemination and utilization of results

The results of the study will be presented to University of Gondar, College of medicine and health sciences, Institute of Public Health and Internal medicine as partial fulfillment criteria for master of clinical tropical infectious disease and HIV medicine & it will be also getting share to ARSHB, South Gondar zone Health office and Debre Tabor hospital administrations. Efforts will also be made to present the results on scientific conferences; and also the results will be disseminated through publication in local or international journal

6. Result

A total of 377 (97.9%) patients chart were reviewed out of 385 patients chart .Eight of them were excluded due to incompleteness.

Socio demographic characteristics

From the total patients 234 (62.1%) were females and the mean age was 35.21 (SD± 9.27) years which ranges from 17 - 71 years. Three hundred seventy five (99.5%) were Amhara ethnic group and 367 (97.3%) were orthodox Christian. From the total patients 291 (77.2%) were urban resident, 191 (50.5%) were married, 111 (29.4%) were Unable to read and write and 100 (26.5%) were civil servant. (Table 1)

Table 1:-Socio demographic characteristics of Anemia among PLWHA taking ART in Debre Tabor Hospital, Northwest Ethiopia, June 2015 (n=377)

Variable	Category	Frequency	percent
Sex	Male	143	37.9
	Female	234	62.1
Age	15-29	92	24.4
	30-39	170	45.1
	40-49	87	23.1
	≥50	28	7.4
Ethnic group	Amhara	375	99.5
	Tigre	2	0.5
Residence	Urban	291	77.2
	Rural	86	22.8
Religion	Orthodox	367	97.3
	Muslim	9	2.4
	Protestant	1	0.3
Marital status	Single	76	20.2
	Married	191	50.7
	Divorced	37	9.8
	Widowed	59	15.6
	Separated	14	3.7
Educational status			
	Unable to read and write	111	29.4
	Read and write	24	6.4
	Primary school	92	24.4
	Secondary school	80	21.2
	College/university	70	18.6
Occupational status			
	Civil servant	100	26.5
	Daily laborer	41	10.9
	Merchant	55	14.6
	House wife	90	23.9
	Retired	3	0.8
	Farmer	42	11.1
	Student	19	5.0
	Unemployed	10	2.7
	Other*	17	4.5

Others*: sex workers, carpenter, shop keeper, waiter and garage worker.

Medication Related factor

From the total participants 112 (29.7%) were taking AZT containing ART regimen and 140 (37.1%) were ART naïve patients (figure 2)

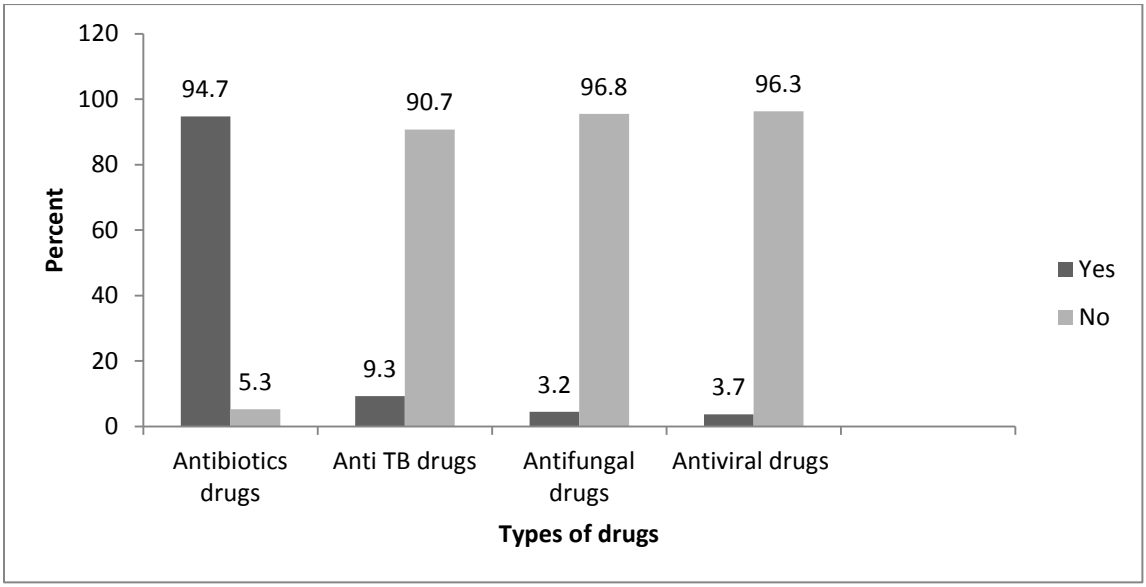

Figure 2: Medication related factors of anemia among adult PLWHA taking ART in Debre Tabor Hospital, Northwest Ethiopia, June 2015 (n=377)

Co morbidity and WHO stage Factor

From the total participants 191 (50.7%) have had opportunistic infections

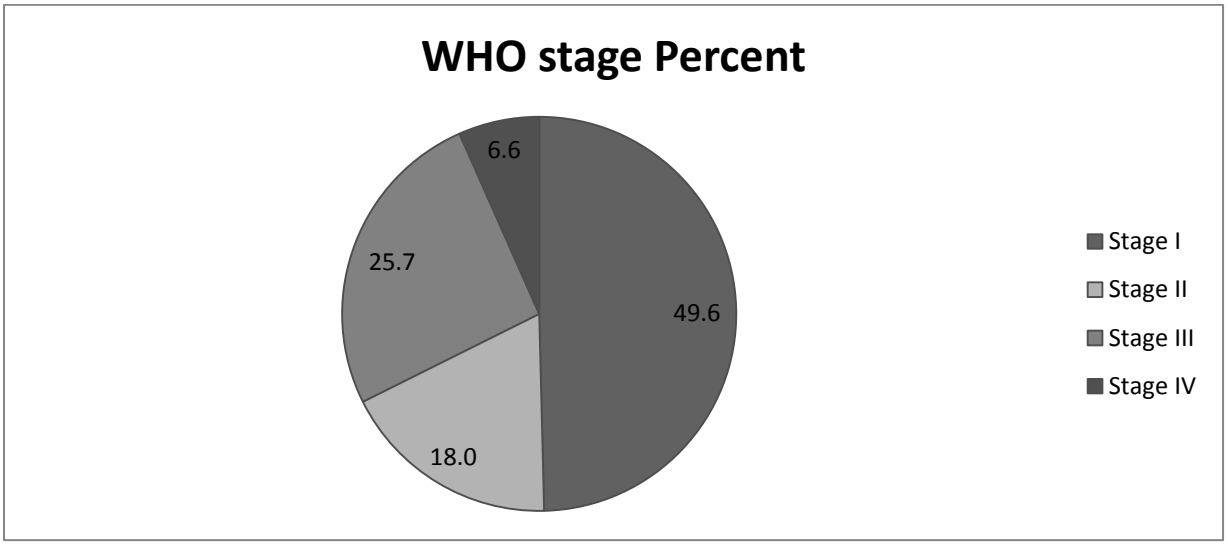

Figure 3: WHO stage factor of anemia among adult PLWHA taking ART in Debre Tabor Hospital, Northwest Ethiopia, June 2015 (n=377)

Hematological and Physical Measurement Factor

From the total participants 126 (33.4%), 73 (19.4%) and 76 (20.2%) have had CD4 count of <200 cells/mm^3, WBC count of <4000 cells/mm^3 and platelet count of < 200,000cells/mm^3 respectively.

Regarding their BMI 281 (74.5%) of the total participant were normal (Table 2)

Table 2:-Body mass index factors of Anemia among adult PLWHA taking ART in Debre Tabor Hospital, Northwest Ethiopia, June 2015 (n=377) (Table 2)

Variable	Frequency	Percent
BMI		
Under weight	82	21.8
Normal	281	74.5
Over weight	13	3.4
Obesity	1	0.3

Prevalence of Anemia among adult PLWHA patients taking ART

The overall prevalence of anemia among adult PLWHA taking ART was 23.1% (95% CI: 19.1, 27.6). The prevalence of anemia among adult male PLWHA taking ART was 37.9% and female adult PLWHA taking ART was 62.1%.

Factors Associated with Anemia

The association of selected socio demographic, medication related factor, co morbidity, hematological related factors and physical measurement on anemia were investigated by using both the bivariate and multi variable logistic regression techniques. Those variables with a P value up to 0.2 in bivariate analysis were included in the multi variable analysis. As a result, types of ART drugs, anti TB drugs, duration of ART usage and CD4 count were significantly associated with anemia.

In this study, HIV/AIDS Patients who were ART naïve were three times (AOR=3.37, 95% CI: 1.59, 7.14) more likely to develop anemia as compared to ART users. Those patients who were taking AZT containing regimen were two times (AOR=2.14, 95% CI: 1.03, 4.57) higher to develop anemia as compared to not taking AZT containing regimen.

HIV/AIDS Patients who were taking ART and those who took anti TB drugs were three times (AOR=3.21, 95% CI: 1.19, 8.67) more likely to develop anemia as compared to patients not taking anti TB drugs.

Those patients who have had CD4 count of < 200 cells/mm^3 were two times (AOR=2.13, 95% CI: 1.04, 4.36) more likely to develop anemia than those with CD4 count ≥ 200 cells/mm^3.

Table 3 : Bivariate and multivariable analysis of factor associated with anemia among adult PLWHA taking ART in Debre Tabor Hospital, North west Ethiopia, June 2015 (n=377) (Table 3)

Variable	Anemia Yes	No	Crude OR (95%CI)	Adjusted OR (95% CI)
Educational Status				
Unable to read & write	17 (15.3%)	94 (84.7%)	1	
Read & write	5 (20.8%)	19 (79.1%)	1.46 (0.48,4.43)	
Primary school	27 (29.3%)	65 (70.7%)	2.29 (1.16,4.55)*	
Secondary school	21 (26.3%)	59 (73.7%)	1.97 (0.96,4.03)	
College/university	17 (24.3%)	53 (75.7%)	1.77 (0.84,3.76)	
Types of ART drugs				
AZT containing	46 (41.1%)	66 (58.9%)	3.80 (2.30,6.29)*	**2.14 (1.03, 4.57)****
Non AZT containing	41 (15.5%)	224 (84.5%)	1	1
Anti TB drugs				
Yes	22 (62.9%)	13 (37.1%)	7.21 (3.45,15.07)*	**3.21 (1.19,8.67)****
No	65 (19%)	277 (81%)	1	1
Antibiotic drugs				
Yes	85 (23.8%)	272 (76.2%)	2.81 (0.64,12.37)	
No	2 (10%)	18 (90%)	1	
Duration of ART usage				
Naïve	61 (43.6%)	79 (56.4%)	6.27 (3.70,10.61)*	**3.37 (1.59,7.14)****
users	26 (11%)	211 (89%)	1	1
History of OI				
Yes	70 (36.6%)	121 (63.4%)	5.75 (3.22,10.26)*	
No	17 (9.1%)	169 (90.9%)	1	
WHO stage				
Stage I	18 (9.6%)	169 (91.4%)	1	
Stage II	5 (7.4%)	63 (92.6%)	0.75 (0.27,2.09)	
Stage III	47 (48.5%)	50 (51.5%)	8.83 (4.71,16.54)*	
Stage IV	17 (68%)	8 (32%)	19.95 (7.56,52.67)*	
CD4 count(cell/mm^3)				
<200	58 (46%)	68 (54%)	6.53 (3.87,11.00)*	**2.13 (1.04,4.36)****
≥200	29 (11.6%)	222 (88.4%)	1	1
WBC count				
<4000	37 (50.7%)	36 (49.3%)	5.22 (3.01,9.05)*	
≥4000	50 (16.4%)	254 (83.6%)	1	
Platelets count				
<200000	34 (44.7%)	42 (55.3%)	3.79(2.20,6.50)*	
≥200000	53 (17.6%)	248 (82.4%)	1	

*P value < 0.05 on bivariate analysis, ** P Value <0.05 on multivariable analysis,

Hosmer and lemeshow test = 0.227

7. Discussion

Anemia is the most common Hematologic abnormalities in persons with HIV patients taking ART (3).This study revealed that 23.1% of HIV/AIDS patients taking ART developed anemia and it's a moderate public health problem(1). This finding was in line with studies done in India (23%) (6) ,Ghana (24%) (8) Jima university hospital Ethiopia (23.1) (16). It was higher than the studies done in Hawassa university hospital Ethiopia (12%) (21) and university of Gonder hospital, Ethiopia (11.5%) (11)**.**However, it was lower than the studies done in Indonesia (49.6%) (7), Uganda (47.8%) (14), Nigeria (57.5%) (9) and Addis Ababa, Ethiopia (33%) (15).This variation may be due to socioeconomic and geographical difference .

In this study, significant association between duration of ART and anemia was observed. Accordingly, ART naïve patients (taking ART ≤ 6 month) were three times more likely to develop anemia as compared to patients on ART (taking ART > 6 month). This study is in line with studies done in Ghana (8), South Africa (17), Hawassa university hospital , Ethiopia (21) and Jima university hospital ,Ethiopia(16). It may be due to; ART naïve patients who had advanced disease with low CD4 count, this advanced disease decreases bone marrow production (low production of the red blood cell in the bone marrow).

Type of ART drugs was another factor significantly associated with occurrence of anemia in this study. As a result, patients who were taking AZT containing regimen were two times more likely to develop anemia as compared to patients who were not taking AZT containing regimen. This finding is supported by study done in Indonesia (7)**,** Iran (22), Namibia (18) and Addis Ababa , Ethiopia (15). This may be due to AZT suppresses the bone marrow, this leads to low production of the red blood cell in the bone marrow.

Anti TB drugs was significantly associated with anemia, hence those patients who took anti TB drugs were three times more likely to develop anemia as compared to patients who didn't took anti TB drugs. This finding is supported by study done in India (23) ,It

may be due to both HIV infection and TB are infiltrate the bone marrow ,this bone marrow infiltration can cause low production of red blood cell.

CD4 count was also found to be significantly associated with occurrence of anemia in this study. Those patients who have had CD4 count of less than 200cells/mm^3 were two times more likely as compared to patients who have had CD4 count of 200cells/mm^3 or more. similar results were reported in studies done in Mexico (24),South Africa (17),Namibia (25) and Ethiopia (15).The possible reason may be due to, patients who had a low CD4 count (low immunity) also experience reduction in the number of certain other cells in their blood .This problem may be caused by damage to bone marrow ,this bone marrow damaging caused by HIV infection per se ,opportunistic infection and some drugs, consequently the probability of anemia also increases

Limitations of the study

This study has limitation including

- Being secondary data (Chart review) leading to incompleteness of clinical information.
- Crosse sectional study design didn't show cause and effect relationship between associated factors and anemia.

8. Conclusions

The prevalence of anemia among adult PLWHA patients taking ART was moderate in this study. Patients taking ART less than 6 month, Zidovudine containing ART regimen, taking anti TB drugs and having CD4 count less than 200 cell/mm^3 were the factors that increases odds of anemia**.**

9. Recommendation

For Debre Tabor Hospital Health worker

Recognizing the fact that reducing the prevalence of anemia is to improve survival and quality of life and also decrease the chance that HIV infection will progress to AIDS. So that early diagnosis and treatment of anemia is recommended for adult PLWHA taking ART particularly, ART naïve patients (taking ART ≤ 6 month), taking anti TB drugs, Zidovudine containing regimen and CD4 count < 200 cells/$mm^{3.}$

For Researcher

Further longitudinal study needed to discover the cause of anemia and include MCV (it used to classify anemia based on morphology) and viral load level

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11. Annexes

Annex 1: information sheet

Research title: Prevalence of Anemia and its associated factors among adult PLWHA patients taking antiretroviral therapy in Debre Tabor Hospital, Northwest Ethiopia

Introduction

This information sheet is prepared to explain the research project to responsible bodies of the hospital administrator. The research team includes a final year MSC graduate student, 3 data collectors and one supervisor from Debre Tabor Hospital, and two advisors from UoG.

Name of Principal Investigator: Hermela Melese (BSC)

Name of Advisor:

1. Mr. Molla Mesele (BSc,MSc)
2. Dr Abilo Tadesse(MD, Associate professor of medicine)

Name of the Sponsor: UoG and ANRSHB

Name of Organization: University of Gondar, College of Medicine and Health Sciences, department of internal medicine

Purpose of the research project:

The purpose of this research study is to assess the prevalence of anemia and its associated factors among adult PLWHA patients taking antiretroviral therapy in Debre Tabor Hospital, Amhara National Regional State, Northwest Ethiopia, 2015.

Procedure:

This study is using hospital based cross-sectional quantitative study design, through used to secondary data. Permission is processed from Debre Tabor hospital administration.

Risk and/or Discomfort:

There is no any risk or discomfort since data is extracted from patient's card. Any personal information registered in the chart is not copied and transferred to other bodies. Every piece of information was kept confidentially.

Benefits: There will be benefit for Debre Tabor hospital HIV/AIDS patients taking HAART.

Confidentiality:

All Personal identifiers & personal information will not take. The information collected from this research project will be kept confidential. Information is accessed by the researcher only

Persons to contact:

This research project is reviewed and approved by the ethical committee of the University of Gondar. If you want to know more information you can contact the committee through the address below.

1. Hermela Melese (BSC)

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2. Mr. Mola Mesele (BSc, MSc)

Phone number: 0920254664

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3. Dr Abilo Tadesse (MD, Associate professor of medicine)

Phone number: 0911405144

Email address: abilo.tadess@yahoo.com

Annex 2: Data compilation checklist

Patient information checklist

Name of the Health facility: _____Identification no._____

Chart no----------

Part 1: Socio demographic factors

S.No	Variables	Response	Remark
101	Sex	1.Male 2.Female	
102	Age	-------- years	
103	Ethnic group	1.Amhara 2.Tigre 3.Oromo 4.Others,specify ----------	
104	Marital status	1.Single 2.Married 3.Divorced 4.Widowed 5.Separated	
105	Religion	1.Ortodox 2.Muslim 3.Protestant 4.Others,specify ,----------	
106	Residence	1.Urban 2.Rural	
107	Educational Status	1.illeterate 2.Read and write 3.Primary school 4.Secondary school 5.Preparatory school 6.College/University completed	
108	Occupational status	1. Civil servant 2. Daily laborer 3. Merchant 4. Housewife 5. Retired 6. Farmer 7. Student 8. Un employed 9. Other	

Part II: Medication related factors

S.No	Variables	Response	Remark
201	Type of ART drugs	1.AZT containing regimen 2.Non AZT containing regimen	
202	Anti TB drugs	1.Yes 2.No	
203	Antibiotic drugs	1.Yes 2.No	
204	Antifungal drugs	1.Yes 2.No	
205	Antiviral drugs(other than ART)	1.Yes 2.No	
206	Duration of HAART usage	1.Naive 2.Users	

Part III: Co-morbidity factors

S.No	Variables	Response	Remark
301	History of Opportunistic infection	1.Yes 2.No	

Part IV: WHO Stage factors

S.No	Variables	Response	Remark
401	WHO stage	1.stage I 2.stage II 3.stage III 4.stage IV	

Part V: Hematologic parameter

S.No	Variables	Response	Remark
501	CD4 count	_____cell/mm^3	
502	WBC count	_____cells/mm^3	
503	platelets count	_____cells/mm^3	
594	Hemoglobin level	_____gm/dl	

Part VI: Physical measurements

S.No	Variables	Response	Remark
601	Height in cm	_____cm	BMI-------
602	Weight in kg	_____ kg	

Name of data collector_____ Signature _____
Name of supervisor _____ Signature _____
Date of data collection_____

Annex 3: Declaration

I, the undersigned, clinical tropical infectious disease and HIV medicine student declare that this research is my original work in partial fulfillment of the requirement for the degree of Master of clinical tropical infectious disease and HIV medicine

Name_____

Signature_____

Place of submission: Department of internal medicine, College of Medicine and Health Sciences, University of Gondar

Date of submission: _____

This research work has been submitted with my/our approval as university advisor/s

Advisors

Name	**Signature**	**Date**
1. **Mr. Mola Mesele (BSc, MSc)**	----------	----------
2. **Dr. Abilo Tadesse (MD, Associate professor of medicine)**	----------	---------

Annex 4. Assurance of the investigator

The under signed agree to accept responsibility for the scientific, ethical and technical conduct of the research project and for provision of required process report as pre terms and conditions of research and publication office of the University of Gondar.

Name of the student - Hermela Melese (BSc)

Date June signature_____

Approval of the advisors

Advisors

Name	Signature	Date
1. Mr.Mola Mesele (BSc, MSc)	_____	_____
2. Dr.Abilo Tadesse (MD, Associate professor of medicine)	_____	_____